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**GRiD 1500 SERIES HARDWARE SERVICE  
COURSE**

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**GRiD**

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# INTRODUCTION

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# **Purpose of the Course**

## **The purpose of the GRiDCASE 1500 Series Service Course:**

- **Give you the knowledge and techniques necessary to perform modular (sub-assembly) level repair of GRiDCASE 1500 series units.**
- **Learn the procedures and guidelines necessary to returning defective units and sub-assemblies to GRiD Systems for repair.**

# Training Objectives

- **Peform modular repair of the GRiDCASE  
1500 systems**

**Perform modular repair of pocket/pouch  
storage peripheral**

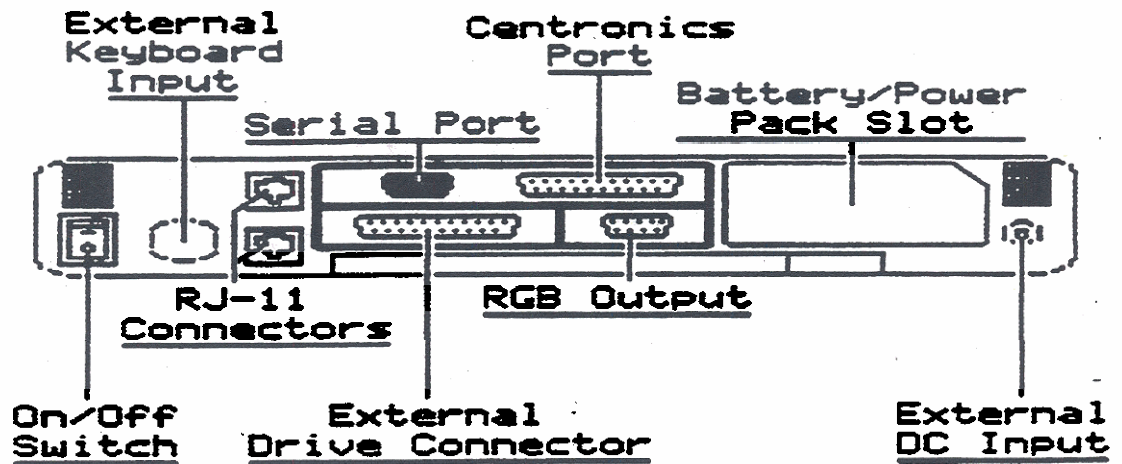
# **What is a GRiDCASE 1500 Series System?**

- **IBM/AT compatible laptop computer**
- **Battery powered**
- **About 12 pounds**

# **An External View of the 1500 Systems**

- **72-key keyboard**
- **2 half-height 3.5" FDD**
- or**
- **1 FDD and a 20 or 40 MB HDD**
- or**
- **40/100 MB HDD only**
- **640 x 400 pixel plasma**
- (or)**
- **Blue LCD**
- or**
- **Yellow LCD internal display (640 x 200 plasma also available)**
- **2 user-accessable application ROM sockets above the keyboard**
- **Major connectors on the rear panel**

# GRiDCASE 1500 REAR PANEL



# **Major Connectors on the Rear Panel**

- **9-pin (IBM AT compatible) RS232 serial connector**
- **Centronics parallel connector**
- **Grid specific external peripheral port**
- **RGB port**
- **DC input connector (+16 volts on the center conductor)**
- **Battery slot/expansion bus connectors**
- **2 parallel-wired RJ-11 connectors**
- **IBM AT compatible external keyboard port**
- **On/Off switch**
- **I/O Expansion bus 40x60 pin edge connectors**

# Three Sacred Cautions

- **DO NOT connect or remove peripherals with the system power on**
- **DO NOT turn off the system while the hard drive activity light is on**
- **NEVER confuse the Centronics port and the external peripheral port (both female DB-25 connectors)**

# **The GRiDCASE 1500 Test Configuration**

**You need the following items in order to fully test 1500 Series Systems:**

- **Pocket/pouch storage peripheral**
- **+16V @ 5A (75W) external DC power supply**
- **Battery pack**
- **9-pin RS-232 serial loopback connector**
- **Centronics loopback connector**

# **System Software Terms to be Covered**

- **Boot ROMs**
- **POST**
- **ROM BIOS**
- **Operating System**

# **Boot ROMs**

**Read Only Memory containing code to initialize the system and run and load the operating system**

- **Memory locations:**
  - **F0000h to FFFFFh (normal memory mode)**
  - **FF0000h to FFFFFFFh (virtual memory mode)**
- **Boot ROMs contain the following software modules:**
  - **System initialization routine or POST**
  - **ROM BIOS**

# POST

- **Power On Self Test**
- **Initializes system and tests critical system components**
- **Halts system operation on a test failure, system emits a "beep code" to indicate error**
- **Follows the IBM AT POST**

# ROM BIOS

- **Low-level sub-routines which directly manipulate the hardware**
- **Interrupt service routines**
- **Provides flexibility between different machines**
- **MS-DOS only accesses hardware through the BIOS**
- **GRiD's BIOS developed by Phoenix Compatibility Corporation**
- **Fully IBM AT compatible**

# Defining “Operating System”

- Provides an interface between the user, software applications and the hardware
- Composed of three functional blocks:
  - User interface
  - File control system
  - System resource manager
- The MS-DOS Operating System
  - Console based, single-tasking, command-line oriented system
    - Console based: interfaces with the user via a teletype or video terminal form
    - Single-tasking: MS-DOS only performs one program at a time
    - Command-line oriented: all commands to the system are entered onto a single command line

# **MS-DOS User Interface**

- **Terminal emulation**
- **Command-line oriented**
- **Characters mapped to the screen from the character generator**

# MS-DOS File Control System

- Media consists of logical “sectors” in groups or “clusters”
- Files have “filenames” and are accessible as entries in a “directory” or “sub-directory”
- Directory entries (filenames) point to a location in a “file allocation table” which points to another location in the table
- Locations in a table correspond to clusters on the disk which comprise the file

# **MS-DOS Resource Manager**

- **Driven by interrupts**
- **Primary interrupt is the "system tick"**
- **640 KB RAM maximum**

# MS-DOS: How it is Loaded

1. System is reset
2. Boot ROMs initialize system...  
*"Phoenix ROM BIOS Ver X.XX, MM/DD/YY"*  
NOTE: date in "Phoenix prompt" indicates the release date of the boot ROMs.
3. Boot ROMs load and execute an MS-DOS bootstrap program
4. Bootstrap loads the files IO.SYS and MSDOS.SYS and executes MSDOS.SYS...  
*"GRiD Systems Corp. MS-DOS BIOS Ver X MM/DD/YY"*  
*Copyright (c) 1986,87,88,89,XX GRiD Systems Corporation*
5. MSDOS.SYS loads the file CONFIG.SYS and the device drivers listed in CONFIG.SYS
6. MSDOS.SYS loads and passes execution to the file COMMAND.COM
7. COMMAND.COM loads and executes the file AUTOEXEC.BAT or prompts you for the time and date
8. COMMAND.COM prompts you with the command line...  
A:>

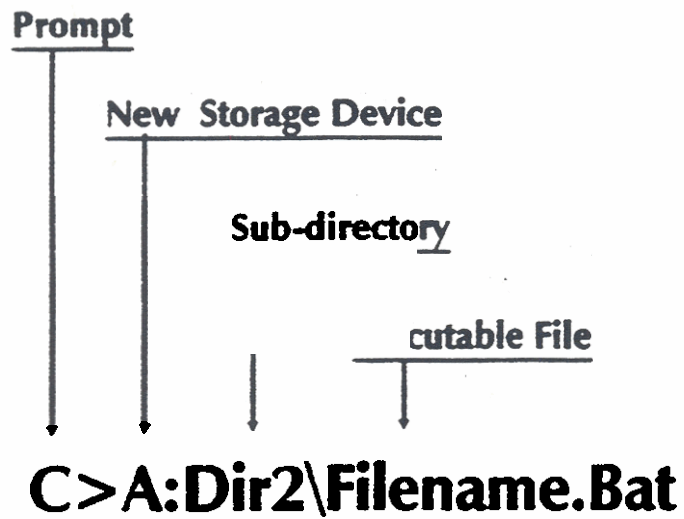
# **MS-DOS Concepts**

- **Command line**
- **Storage devices**
- **Directories and sub-directories**

## **Built-in commands**

- **MS-DOS files:**
  - **Executable files**
  - **Batch files**
- **Parameters**
- **I/O Devices**

# Command Line Components



# Storage Devices

- Application ROMs
- Floppy disk drives
- Hard disk drive

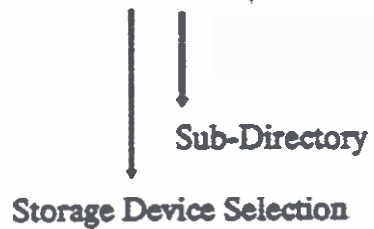
**Pocket/pouch floppy disk drive**

- MS-dos assigns a consecutive letter to each of the storage device (A:,B:,C:, etc)
- Application ROMs are usually associated with disk drive

# Sub-Directories

- Allow expansion of the number of files accessible on the disk
- Allow further organization of the disk
- Are accessed by putting the name of the sub-directory desired, followed by a back-slash(\) between the storage device selection and the filename

C> A:SUB1\FILENAME



# **MS-DOS Built-in Commands**

**BREAK  
CH OR CHDIR  
CLS  
COPY  
CTTY  
DATE  
DEL OR ERASE  
DIR  
EXIT  
MD OR MKDIR  
PATH  
PROMPT  
RD OR RMDIR  
REN OR RENAME  
SET  
TIME  
TYPE  
VER  
VERIFY**

# **MS-DOS Files**

- **All files have names up to 8 characters long**
- **Optional 3 character extensions**
- **The extensions .EXE and .COM are reserved for executable files**
- **The extension. BAT is reserved for batch files**

# Executable Files

- An executable file is any file that MS-DOS can execute directly
- Machine language files
- There are two types of executable files:
  - filename.com
  - Filename.EXE

# Parameters

- Parameters are used to pass information to a file to be executed
- Used to alter or specify the behavior of an executed file
- Parameters are separated from the filename by a space or a slash (/) character

**C>FORMAT A:/S**



Parameter

# Batch Files

- A batch file is a specialized type of text file
- Batch files are used to enter commands into the MS-DOS command line that are repetitive, ungainly or impractical to do by hand
- Typical batch files are as follows:
  - BURNIN.BAT

# **A Listing of Batch File @BURNIN.BAT**

- **A TYPE @BURNIN.BAT**
- **ROMCHECK**
- **APPSCHK SA**
- **CHK8087 SA**
- **CLOCKTST SA**
- **MEDIACHK SA**
- **DISPLAY SA**
- **SIOLOOP SA**
- **MODEMTST SA**
- **PRNLOOP SA**
- **VIDEORAM SA**
- **SPKRCHK SA**
- **RAMTEST R**

# **MS-DOS Utilities Exercise**

- **During this exercise, you will connect the following devices to the system:**
  - **Pocket floppy disk drive**
  - **External power supply**

# **The MS-DOS Exercise**

**Turn to the System Utilities exercise in part 2 of the GRiDCASE 1500 Field Diagnostics Reference Guide.**

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## **GRiDCASE 1500 DESIGN OVERVIEW**

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# Design Requirements

- IBM AT Compatibility
- Portability
- Power-saving abilities

# **IBM AT Compatibility**

- **From the software point-of-view**
- **As it affects hardware**

# **IBM AT Compatibility: The Software Point-of-View**

- **Programs written to run on the IBM AT run the same way on the GRiDCASE 1500**
- **Compatible machine language**
- **Same or compatible BIOS**

# **Compatibility :As It Affects the Hardware**

- **80C286/80386 processor**
- **Similar memory mapping**
- **Similar I/O mapping**
- **Similar DMA, timer, and interrupt functions**
- **Compatible or the same major functions/components**

# **Portability:How It Affects Hardware**

- **Battery powered**
- **Small, light construction**
- **Require smaller 3.5 inch, high-density, floppy and hard drive technologies**
- **Up to 256 KB of application ROMs**

# **Power Saving In The GRiDCASE 1500**

- **CMOS hardware is used**
- **VLSI technology used where possible**
- **Non-CMOS hardware limited as much as possible**
- **80287 coprocessor**

# Construction Practices

**Main logic board performs most of the operations of the system**

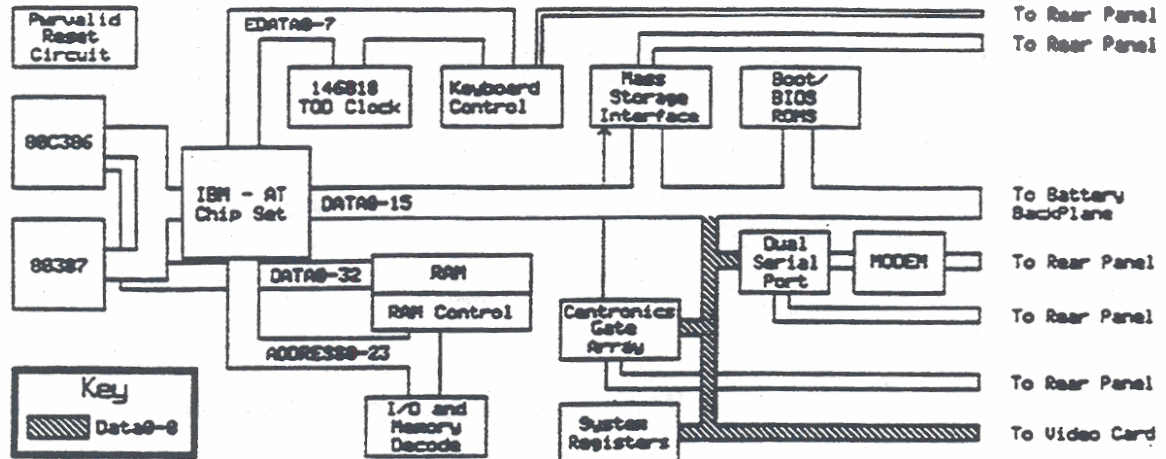
- **Video card follows the main logic board in level of complexity**
- **Mass storage devices and the display are monolithic (no serviceable parts)**
- **The other system components are fairly passive**

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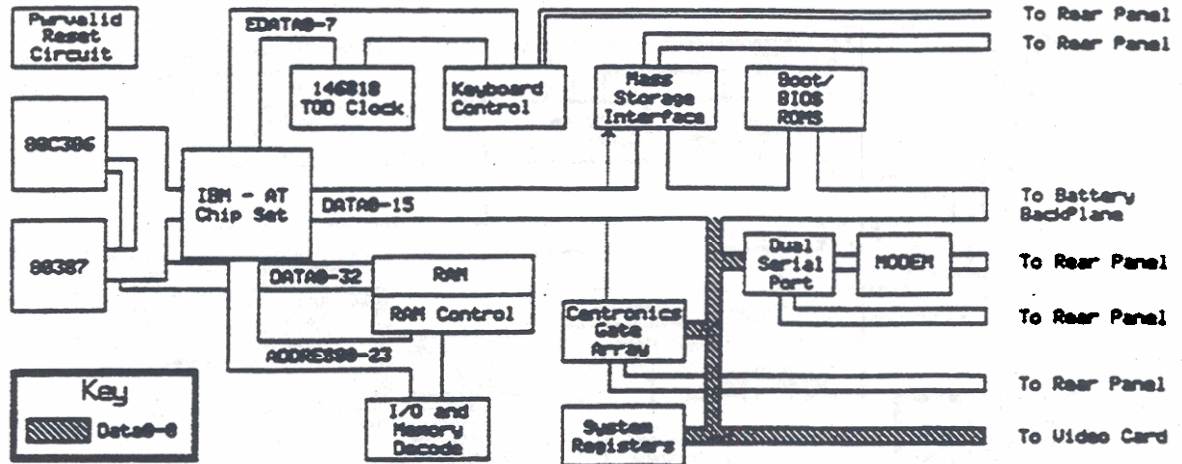
## **GRiDCASE 1500 Theory of Operations**

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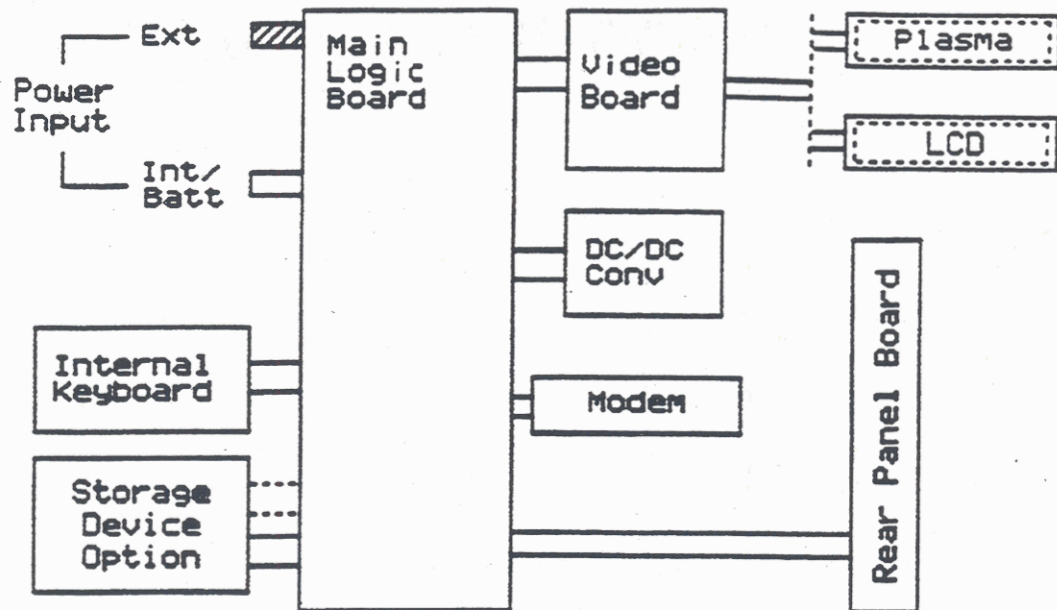
## GRiDCASE 1520 Main Logic Board Block Diagram



## GRiDCASE 1530 Main Logic Board Block Diagram



## GRiDCASE 1500 Sub-assembly Block Diagram



### Key

-  Direct part to part connection
-  Cable
-  Optional connection

# **The Main Logic Board's Most Important Circuits**

1. **Clocks**
2. **Powervalid circuit**
3. **Microprocessors**
4. **IBM AT VLSI chip set**
5. **Decode and system registers**
6. **Boot ROMs**
7. **RAM control**
8. **RAM**
9. **146818 time-of-day clock**

# Clocks

- **14.318 MHz crystal oscillator for timer/counter functions in the IBM-AT chip set**
- **20 MHz clock (1520) or 25 MHz clock (1530) system clock for CPU clock generation on the IBM-AT chip set and RAM control**

# **Powervalid Circuit**

- **Purposes:**
  - **To allow system operation if the +5 and +12 volt supplies have stabilized**
  - **To initiate reset at power-on**
- **Reset is generated by the IBM AT chip set and used to initialize the CPU and other circuitry**

# Microprocessors

- **80C286:**
  - **16-bit data bus**
  - **24-bit address bus**
- **80386:**
  - **32-bit data bus**
  - **32-bit address bus**
- **After reset, the 80C86 executes the code at address FFFF0h**

# IBM AT Chip Set

- 4 VLSI gate arrays:
  - FE 3000 CPU controller
  - FE 3010 peripheral functions
  - FE 3020 address buffer
  - FE 3030 data buffer

# **FE 3000 CPU Controller**

- **Generates CPU clock**
- **Controls wait state generation**
- **Controls CPU cycle interruption for interrupts and DMA**
- **Generates CPU READY line**

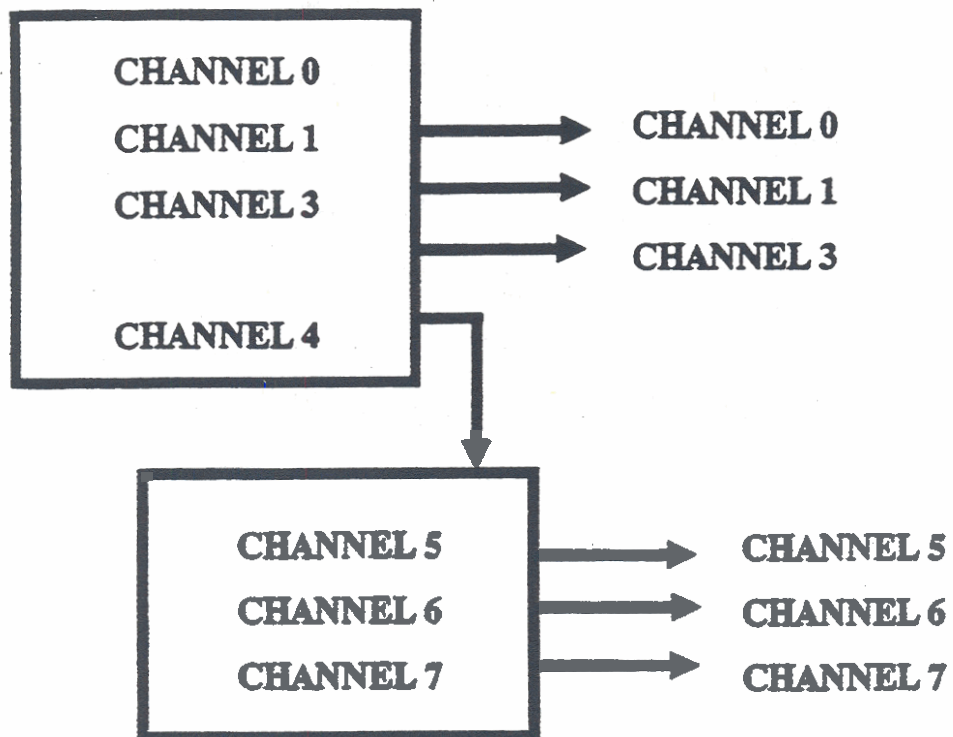
# FE 3010 Peripheral Functions

- Consists of the DMA, interrupt and memory refresh generation circuitry

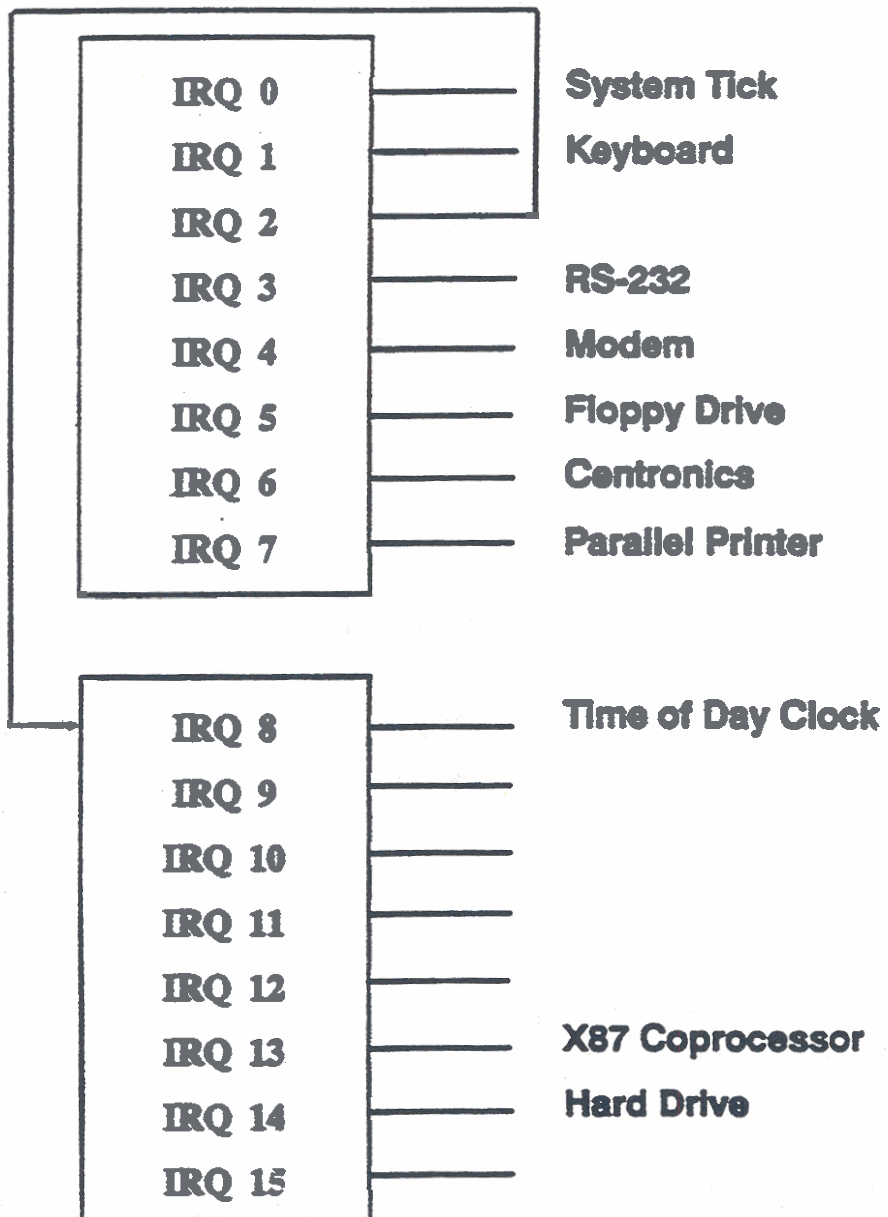
Contains the equivalent of two 8237 DMA controllers, two 8259 interrupt controllers, and one 8254 timer/counter

- Timer/counter provides 2 functions:
  - TC1: Refresh
  - TC2: Speaker tone
- I/O ports, and interconnections of the DMA, interrupt, and timer functions emulates the same circuitry in the IBM AT.

# DMA Function



# Interrupt Functions



# **FE 3030 Data Buffer**

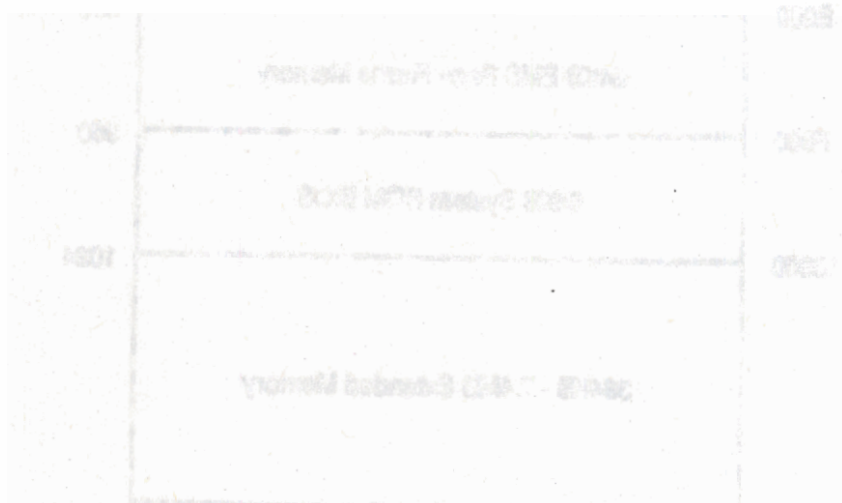
- **Bi-directional buffered data lines DATA0-15**
- **Partially active (during I/O addressing 0-100h) buffered data lines EDATA0-7**

# **Decode/System Registers**

- **Decode generates chip select signals from address bus for memory and I/O activity**
- **The system registers are used to control some system functions:**
  - **serial port reset**
  - **applications ROM enable**

# System I/O MAP

|          |                                     |
|----------|-------------------------------------|
| 000-01F  | DMA control, channels 0-3           |
| 020-021h | Interrupt control, channels 0-7     |
| 040-043h | Timer/counter                       |
| 060-063h | Keyboard controller                 |
| 070h     | NMI mask register                   |
| 080-08Fh | DMA page registers                  |
| 0A0-0BFh | Interrupt control, channels 8-15    |
| 0C0-0DFh | DMA control, channel 5-7            |
| 0F0-0FFh | 80287/387 coprocessor control ports |
| FB-2FEh  | COM2 (RS-232) serial interface      |
| 378-37Ah | Centronics parallel interface       |
| 3D0-3DFh | Video Control                       |
| 3F2-3F5h | Internal floppy disk control        |
| 3F8-3FEh | COM1 (modem) serial interface       |
| 440h     | Application ROM mapping             |



# System Memory Map

| Hex Address |                                                                               | Decimal Address |
|-------------|-------------------------------------------------------------------------------|-----------------|
| 0           | 640KB Conventional Memory                                                     | 0               |
| A000        | 64KB EGA/VGA Display Memory<br>(not used, except with VGA cartridge)          | 640             |
| B000        | 32KB EGA/VGA Display Memory<br>(not used, except with VGA cartridge)          | 704             |
| B800        | 32KB CGA Display Memory<br>(used for standard 1530 Display and VGA cartridge) | 736             |
| C000        | 128KB Memory for expansion/Peripheral ROMs                                    | 768             |
| E000        | 64KB EMS Page Frame Memory                                                    | 896             |
| F000        | 64KB System ROM BIOS                                                          | 960             |
| 10000       | 384KB - 7.4MB Extended Memory                                                 | 1024            |

Also used for  
Mapping  
Application  
ROMs

Low MS-DOS  
Memory

High MS-DOS  
Memory

# System Registers

- Control of non-AT standard system options
- On/Off condition only (DATA 0)
- I/O ports affected:

402h- application ROM size select

405h- Memsize 0

406h- Memsize 1

407h- AT or EMS

416h- CPU clock speed select (slow or fast)

420h- Modem: analog loopback mode

421h- Modem: RSSIGS

423h- Centronics port:read enable

424h- Modem: Analog to speaker enable

426h- Modem reset

427h- Modem on

# Boot ROMs

- Located at F0000h to FFFFFh (conventional mode) and F0000h to FFFFFFFh (virtual/protected mode) in the system memory map
- Contain the system boot/Power-On-Self-Test (POST) diagnostics firmware
- Contain the BIOS: subroutines or calls used to perform basic software functions in the system
- Contain the bootstrap loader routine
- 150ns or faster chips

# System RAM

- **Dynamic RAM**
- **256KX8 or 1MX8 RAMsticks, 120ns or faster**
- **Multiplexed addressing onto the chips**
- **Address multiplexing and chip selects generated by RAM controller**
- **1520 has 16-bit memory bus**
- **1530 has 32-bit memory bus**

# RAM Controller

- **Generates RAS and CAS address strobes and chip selects**
- **Facilitates refresh**
- **Restructures RAM access to fit IBM AT memory map**
- **1520:**
  - **256K RAM controller for 256K RAMsticks**
  - **1M RAM controller for 1M RAM sticks**
- **1530:**
  - **Sheppard RAM controller for either type of RAMstick**

# Interfaces to the Real World

- 8741 keyboard controller
- Centronics interface
- RS-232 and modem serial ports
- 146818 time of day clock chip

# 8741 Keyboard Controller

- Micro-controller technology
- Scans internal keyboard matrix
- Accepts input from IBM AT compatible external keyboard
- Controls EL backlight in LCD units
- Controls speaker

# Centronics Interface

- Centronics parallel data I/O
- Primarily used for printer output
- Provides pocket floppy configuration information
- Gate array technology

# **RS-232 and Modem Serial Controller**

- **Asynchronous communications via the RS-232 port and Hayes compatible modem**

**COM1: Modem**

**COM2: RS-232 IBM AT compatible 9-pin port**

- **1520: two 82C50 UARTs**
- **1530: one VLSI dual UART**

# **146818 Time of Day Clock Chip**

- **Provide time of day, date and system configuration information**
- **Powered by 3.6 V lithium cell when system is off**

# **Mass Storage Interfaces**

- **Application ROM control**
- **72065 floppy disk drive control**
- **Hard disk drive control**

# **Application ROM Control**

- **Up to 256KB of application ROM software**
- **28 - or 32-pin chips can be used**
- **All control circuitry on the video card**

# 72065 Floppy Disk Drive Control

- **72065 controls the following:**
  - **head positioning and selection**
  - **drive read/write**
  - **DMA to and from system memory**
- **72065 controller supports 3.5 and 5.25 inch, DD and HD IBM formats internally**
- **Disk drive selection and motor enable occurs outside the 72065**
- **Gate array technology provides drive and motor selection**

# **Initialization Sequence**

- 1. Test CMOS components (IBM AT chip set and time of day clock chip registers)**
- 2. Test first 64KB of RAM**
- 3. Checks video card**
- 4. Initializes and starts hard disk drive if present**
- 5. Determines size of RAM**
- 6. Beeps (end of POST)**
- 7. Scans storage devices for a valid bootstrap**

# **Boot Sequence**

**System searches for DOS bootstrap in following order:**

- 1. Application ROMs**
- 2. Internal floppy disk drive**
- 3. Internal hard disk drive**
- 4. Pocket/pouch floppy drive**

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## **Theory of Operation: Other Sub-Assemblies**

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# What are the Sub-assemblies?

- Video card
- DC/DC converter
- Display
- Keyboard
- Mass storage assembly
- Expansion bus/battery backplane

# Video Card

- **CGA compatible**
- **Consists of:**
  - **Video controller chip**
  - **32KB video RAM**
  - **32KB character generator ROM with four fonts in normal and intensity modes**
  - **2 32-pin JEDEC compatible application ROM sockets**

# Display Modes

- **Alphanumeric mode:**
  - 80X25 or 40X25
  - 2 bytes/charater: 1st byte character, 2nd byte attribute
  - Monochrome on internal monitir with underline available
  - Character generator is used in this mode
- **Default mode for MS-DOS/COMMAND.COM**
- **320x200 Graphics mode**
  - 4 color graphics
  - 4 pixels per byte (2 bits/pixel)
  - video RAM divided into two blocks
  - 1st block: even scan lines
  - 2nd block: odd scan lines
- **640X200 Graphics Mode**

- Each bit of each video memory byte displayed:left to right, MSB to LSB
- Video RAM divided into two blocks...
- 1st block: even scan lines
- 2nd block: odd scan lines
- 640X400 graphics mode:
  - Each bit of each vidieo memory byte displayed:
  - -left to right
  - -MSB to LSB
- Video RAM divided into four blocks:
  - 1st block: scan lines 0, 4, 8, 12
  - 2nd block: scan lines 1, 5, 9, 13
  - 3rd block: scan lines 2, 6, 10, 14
  - 4th block: scan lines 3, 7, 11, 15
  - IBM, AT&T, and Toshiba 640X400 display modes supported

# DC/DC Converter

- 2 types of DC/DC converter used to support LCD and plasma displays
- Input 9 to 20 volts
- 4 inputs:

| LCD / 4 - OUTPUT        |        |
|-------------------------|--------|
| For Hard Drive          | + 12V  |
| Logic Board, Hard Drive | + 5V   |
| LCD, Modem              | - 24V  |
| EI Backlite             | - 100V |
| PLASMA / 4 - OUTPUT     |        |
| Plasma                  | + 33V  |
| Hard Drive              | + 12V  |
| Logic Board, Hard Drive | + 5V   |
| Modem, Display          | - 15V  |

# Display

- 640 by 400 pixel
- 1:1 pixel aspect ratio
- EL backlit in LCD models

# **Internal Keyboard**

- **Internal keyboard is a switch matrix**
- **Completely passive**

# Mass Storage Assembly

- 1 of the 5 following options:
  - Two 1.44MB FDDs
  - One 1.44MB and one 20MB HDD
  - One 40MB HDD
  - One 1.44MB FDD and 1/2 height 40MB HDD
  - One 100MB HDD
- Each configuration requires an appropriate backplane

# **Application ROMs**

- **User accessible application ROMs**
- **28-pin or 32-pin ROMs:**
  - **32KB, 64KB or 128KB EPROMs**
  - **128KB masked ROMs**

# **Expansion Bus/Battery Backplane**

**Supply IBM XT and AT expansion buses**

- **Provide for user OEM cartridge peripherals**

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## **FIELD DIAGNOSTIC PROGRAMS**

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# Diagnostic Characteristics

- **Menu driven**
- **Failures displayed**
- **Hidden functions (such as monitor mode functions)**
- **Command line:**

**/SA=       stand alone mode**

**/L#=       loop or repeat mode**

**/M=       monitor mode  
          /CONFIG**

**/S5/E6=   test limiters**

# **Diagnostics Which Just Verify**

- **ROMCHECK**
- **APPSCHK**
- **NCONFIG CONFIG**
- **KEYTEST**
- **DISPLAY**
- **PRNCHECK**
- **CHK8087**

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# ROMCHECK

## Test Function:

- Checksums the boot ROMsm and any user ROMs on the expansion bus
- Displays the ROMs date codes

## Results:

- Pass/fail
- ROM date codes

# APPSCHK

## Test Function:

- Tests application ROM sockets for presence of ROMs
- Identifies and checksums present application ROMs

## Results

### **"EMPTY ROM SOCKET":**

no ROM found in socket

### **"ROM ERROR!!":**

detects ROM in socket but of the incorrect format

### **"CHECKSUM ERROR!":**

ROM in socket fails checksum

### **"UNKNOWN ROM":**

ROM is currently formatted and passes checksum, but the test can't identify the ROM. This is not necessarily a failure

# **NCONFIG CONFIG**

## **Test Function:**

- **Verifies the operation of the system options**
- **Checksums and identifies application ROMs**

## **Results:**

- **Displays present system options**
- **Displays all failures**
- **Beeps and freezes on failures**

# Model Options for Python/Cobra 1520 and 1530

|            |                            |            |                                       |            |                                         |
|------------|----------------------------|------------|---------------------------------------|------------|-----------------------------------------|
| <b>280</b> | <b>Yellow LCD</b>          | <b>318</b> | <b>Dual Floppy</b>                    | <b>341</b> | <b>80387 1530 Math Coprocessor</b>      |
| <b>281</b> | <b>9.4" Plasma 640x200</b> | <b>320</b> | <b>10MB HDD &amp; 1.44MB 3.5" FDD</b> | <b>344</b> | <b>40MB HDD (1/2 ht) &amp; 3.5" FDD</b> |
| <b>282</b> | <b>10" Plasma 640x400</b>  | <b>321</b> | <b>20MB HDD &amp; 1.44MB 3.5" FDD</b> | <b>370</b> | <b>MS-DOS ROMs3.21</b>                  |
| <b>283</b> | <b>Blue LCD</b>            | <b>324</b> | <b>40MB Hard Drive</b>                | <b>371</b> | <b>MS-DOS 3.21/XTalk ROMs</b>           |
| <b>287</b> | <b>LCD(VGA)</b>            | <b>325</b> | <b>100MB Hard Drive</b>               | <b>372</b> | <b>MS-DOS 3/3</b>                       |
| <b>301</b> | <b>1MB RAM</b>             | <b>330</b> | <b>1200 Band Modem</b>                | <b>373</b> | <b>MS-DOS 3.3/XTalk</b>                 |
| <b>302</b> | <b>2MB RAM</b>             | <b>331</b> | <b>2400 Band Modem</b>                | <b>376</b> | <b>Crosstalk ROM</b>                    |
| <b>304</b> | <b>4MB RMA</b>             | <b>332</b> | <b>MNP 2400 Band Modem</b>            | <b>382</b> | <b>MS-DOS 3.21</b>                      |
| <b>308</b> | <b>8MB RAM</b>             | <b>340</b> | <b>80287 1520 Math Coprocessor</b>    |            |                                         |

# KEYTEST

## Test Function:

- Verifies the operation of the internal and external keyboard

## Results:

- Beeps on incorrectly received scancodes
- Indicates when all keys have been tested

# DISPLAY

## **Test Function:**

- **Facilitates inspection of the display for the following symptoms:**
- **Blacked out pixels, vertical and horizontal lines**
- **Permanently turned on pixels, vertical and horizontal lines**
- **Bleeding between pixels, vertical and horizontal lines**
- **Half-lit pixels**
- **Ghosts on the display, or screen hysteresis**

# PRNCHECK

## Test Function:

- Verifies correct data transfer between the system and a printer

## Results

- Prints the following characters 5 times:

ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890- + + ? ; ! @ # \$ % ^ & \* ()

DISPLAYS PROMPT, "ERROR TRYING TO INITIALIZE PRINTER!!"

# CHK8087

## Test Function:

- Tests for the presence of 802087 or 80387 coprocessor
- Verifies performance and accuracy of the coprocessor

## Results:

- Not installed/pass/fail

# **Diagnostics Which Return Error Data**

- **SPKRCHK**
- **RAMTEST**

# **SPKRCHK**

## **Test Function:**

- **Verify operation of speaker**

## **Results:**

- **Display error message if speaker control circuitry fails**
- **Operator must verify warbling, strutting, and silent phases of speaker operation**

# RAMTEST

## **Test Function:**

- Tests write and read function of system RAM (first 640KB)

## **Results:**

- Displays first error

(Note: system must be reset after test)

# Diagnostics Which Return Detailed Error Data

- VIDEORAM
- PRNLOOP
- CLOCKTST
- SIOLOOP
- MODEMTST
- MEDIACHK

# VIDEORAM

## **Test Function:**

- **Writes and reads to the video RAM**

## **Results:**

- **Displays errors encountered**
- **Jumps into monitor mode on error**

# PRNLOOP

## Test Function:

- Verifies operation of status, control, and data registers of the line printer interface
- Loops on test 100 times

## Results:

- Jumps into monitor mode on error
- Displays expected and actual data received during test

# CLOCKTST

## **Test Function:**

- Tests internal register of real time clock chip
- Sets time in real time clock chip

## **Results:**

- Displays error encountered in reading and writing to RTC registers
- Allows user to set time
- Jumps into monitor mode if error occurs

# SIOLOOP

## **Test Function:**

- **Tests the internal registers of the serial controller (COM2)**
- **Tests the serial control lines 9RTS,CTS,DTTR,DSR,RI ...)**
- **Tests the transmit and receive lines for variable baud rates**

## **Results:**

- **Jumps into monitor mode if an error occurs**
- **Display error, actual and expected data**

# MODEMTST

## Test Function:

- Should only be used with the /SA parameter in the field

## Results:

- Jumps into monitor mode is an error coours
- Displays error, actual and expected data

# MEDIACHK

## **Test Function:**

- **Tests reading and writing to the internal disk drive with 6 sub-tests:**

1. **Access test  
(random read and write)**
2. **Free disk space  
(tests unused sectors)**
3. **Sequential read  
(of all sectors)**
4. **Sequential write  
(of all sectors)**
5. **Random read**
6. **Random write**

## **Results:**

- **Displays error sector location on disk**
- **Displays error type**
- **Jumps into monitor mode on error**
- **Use monitor mode to select between drives**

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## **FIELD DIAGNOSTIC LAB**

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# Diagnostic Lab

1. **Make sure the following peripherals are attached to the system:**
  - a. **RS-232 serial loopback connector**
  - b. **Pocket peripheral**
  - c. **Centronics loopback connector**
  - d. **External power supply**
2. **Place the diagnostic disk in the internal floppy drive**
3. **Turn the system on. Press the "F" key after the system beeps**
4. **Enter the time and date as directed**
5. **Type @BURNIN.BAT on the command line and follow any instructions displayed**

# **Disassembly/Reassembly Lab**

- 1. Disassemble the system following the procedure in the Maintenance Manual**
- 2. Reassemble the system following the procedure in the Maintenance Manual**
- 3. Test the unit using @BURNIN.BAT on the diagnostic disk**

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## **EXTERNAL THEORY OF OPERATION**

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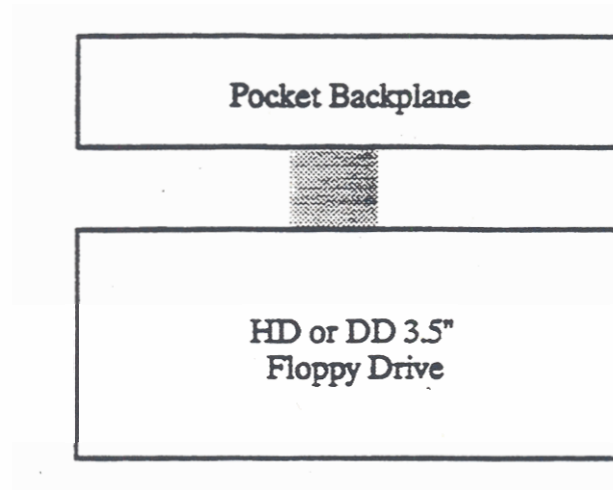
# What is the External Peripheral Bus?

- **Extension of the internal FDD bus**
- **Consists of the following :**
  - **Power**
  - **Servo control**
  - **Drive and head select**
  - **Read and write data, and write enable**
  - **Precompensation**
  - **Drive status**
  - **TTL compatible**

# The Pocket/Pouch Peripherals

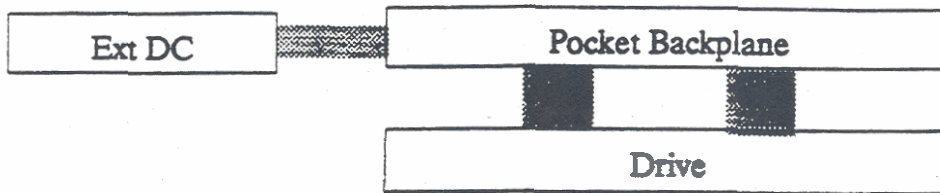
- 32170: 720KB  
3.5" floppy drive
- 3401: 1.44MB  
3.5" floppy drive
- 3402: 360KB  
5.25" floppy drive
- 3403: 40MB  
streaming tape drive (BACKEZ only)
- 3404: 1.2MB  
5.25" floppy drive (XENIX)

# Pocket Floppy Block Diagram



- Backplane select switches wired in parallel
- Jumper J1 (high density select)

# Pouch Drive Block Diagram



- Backplane's 12V and 5V regulators require +16VDC to operate
- Jumpers J1 (high density select) and J2 (tape drive present)
- Drive signal and power cables vary between peripherals

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## **Repair Philosophy**

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# **GRiD's Field Repair Viewpoint**

- **Field repair takes place at the sub-assembly level**
- **The VIRT technique**
- **Performing sub-assembly updates**

# **Component Level Repair Policies**

- **GRiD does not actively encourage component level replacement in the field**
- **Evidence in the repair center of field component replacement will be regarded as "mishandled"**
- **Replacement of socketed components is acceptable**

**V**ERIFY

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**I**DENTIFY

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**R**EPLACE

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**T**EST and BURN-IN

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# Workshop Evaluation Form

## Directions:

Please circle the numbers and complete the sentences below. Select the answers which best describe your experiences in this workshop.

1. *Was the new information accurate and effectively presented?*

High Low

7    6    5    4    3    2    1

2. *Did you get enough hands-on experience with the computer?*

High Low

7    6    5    4    3    2    1

3. *How well did the workshop meet your expectations?*

High Low

7    6    5    4    3    2    1

4. *How much more effective do you expect to be, on the job, as a result of this workshop?*

0%    5%    10%    25%    50%    100%    200%    400%

5. *How much more productive do you expect to be as a result of this workshop?*

0%    5%    10%    25%    50%    100%    200%    400%

6. *What part of the workshop was the most interesting to you?*

7. *What part of the workshop will you use the most when you get back to your job?*

8. *How does this workshop compare with others you have taken?*

9. *Would you recommend this workshop to others in your organisation? Why?*

10. *How does the workshop rate, overall?*

High Low

7    6    5    4    3    2    1

Workshop Title: GRiDCASE 1500 Hardware Service Course

Attendance Dates:

Company Name:

Participant Name:

Instructor Name: